Anticoccidial effect of garlic on leghorn chickens

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Abstract:-An experimental study was conducted from October 2014 to April 2015 at Haramaya University to detect the effect of garlic powder (*Allium sativum*) in disease of poultry Coccidiosis. Coccidiosis is an important and a major parasitic disease of poultry caused by *Eimeria* Species. For this purpose, 2months of 30 white leghorns chickens were selected. Simple salt floatation techniques was employed two to three times for coprological examination to check those chickens were free from coccidian disease. Then chickens were divided into 5 equal groups, each of 6 chickens and G1, G2, and G3 were given different concentration of garlic for seven days, after seven days all groups were infected with approximately 50,000 viable sporulated oocysts of *Eimeria tennella* 1ml with distilled water orally. G1, G2 and G3 were infected and supplemented with garlic powders at 2, 4 and 8 g/L, respectively. G4 was infected and treated with Amprollium at 1.25 g/L but G5 was infected not treated and used as a control group. After 5, 8, 11, 14 and 17 days post treatment excretion of oocysts and blood in feces were examined. Reduction of total oocysts count in garlic supplemented group seen as the dose of garlic increased. From garlic treated group high reduction of oocysts were examined in T3 (8g garlic/L) treated group which is not significantly different from T4 treated by amprollium ($P<0.05$). It is concluded that Garlic powder was more effective in prevention and control of Coccidiosis so supplementation of garlic in poultry feed is needed to prevent Coccidiosis.
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1. Introduction

Garlic (*Allium sativum*) is widely used and distributed in most parts of the world because of its many beneficial properties and it is rich in organosulfur substances, such as *allicin, diallyl sulfide*, and *diallyl trisulfide*. The *allicin* gives garlic its characteristic odour and flavour as well as most of its biological properties (Chowdhury *et al*., 2002). In poultry nutrition, garlic is known to result in improved growth inhibition of growth of pathogens in the gut enhanced pancreatic function and improved meat and carcass quality (Kim *et al.,* 2009). There are numerous reports indicating the efficacy of garlic in the prevention and treatment of a variety of diseases (Hajizadez, 2006).

Approximately 20 billion poultry exist worldwide and of this about 75% are in developing countries (Gebremariam *et al*., 2011). The total poultry production of Ethiopia is estimated at 56.5 million, of which about 99% are raised under the traditional backyard system of management, while 1% is exotic breeds maintained under intensive management system. The intensive management system is characterized by high input, high output, and low destruction of the flock due to disease outbreak as compared to the backyard poultry production system (Ashenafi and Eshetu, 2004).

Coccidiosis is an important and a major parasitic disease of poultry caused by *Eimeria* Species. The disease has a great economic impact in poultry productions partly due to resistance of the organisms to anticoccidial drugs. Cross and multiple resistance of anticoccidial drugs occurred when these drugs were tested on various *Eimeria* organisms (Alim Madziga, 2011). The two most important *Eimeria* species that cause severe disease in poultry are *E.tenella* and *E.necatrix* (Grat *et al*., 1996). In Ethiopia quantitative losses due to coccidosis are not well documented but previous studies reported high prevalence of the disease in all production systems (Hagos, 2000).

Natural products are a major source of new natural drugs and their use as an alternative medicine for treatment of various diseases has been increased in the last few decades (Vuorelaa *et al*., 2004). In comparison to the formulated drugs the herbs and spices have fewer side effects. They are also inexpensive, show better patient tolerance and are readily available for low socioeconomic population (Adeshina *et al.,* 2011).

The use of safe and effective medicinal plants can reduce farmers' input costs, preserve the resource base, enhance biodiversity and protect animal health (Duman *et al*., 2008). Garlic (*Allium sativum*) has the broadest spectrum of any antimicrobial substance that

we know of it, is antibacterial, antifungal, antiparasitic, antiprotozoan and antiviral. Subsequent experiments have shown garlic to be effective not only against the parasitic amoebae that cause dysentery, but against other organisms such as toxoplasma, cryptosporidia, and pneumocystis, all of which cause disease in humans (Ansari *et al*., 2006). Garlic exhibits hypolipidemic, antiplatelet, and procirculatory effects. It prevents cold and flu symptoms through immune enhancement and demonstrates anticancer and chemopreventive activities (Amagase, *et al*., 2001). Most of the medicinal effects of garlic are preferable to a sulfur compound known as *allicin* (Mahmoodi *et al.*, 2006). This paper have shown that there is need to further explore the possibility of identifying a more viable anticocidial drugs which will be effective against the *Eimeria* species in order to reduce the economic impact of the disease on poultry production particularly, in smallholder chicken farmers in rural areas that have access to natural products such as garlic than modern anticoccidial drugs.

Therefore, the study is designed:-

- To determine the effect of a dry herbal powder derived from garlic (*Allium sativum*) on *Eimeria* spp. and to give recommendation on its use as an anticoccidial agent based on the results of the study.

2. Materials And Methods

2.1. Study Area Description

The experiment was conducted at Haramaya University poultry farm, which is located 515 km east of the capital, Addis Ababa. The site is situated at an altitude of 1980 mater above sea level, 9^0 26' N latitude and 42^0 3' E longitudes. The mean annual rainfall of the area is 780 mm and the average minimum and maximum temperatures are 8 ^{0}C and 24 ^{0}C, respectively (Samuel, 2008).

2.2. Study Animals

A total of 30 white leghorn chickens with the age of 2 months were selected and allocated to 5 groups, each of 6 chickens. Group 1,2,3 were infected with approximately 50,000 oocysts and treated with 2gm,4gm, and 8gm of garlic powder with per liter of drinking water respectively. Group 4 given common drug amprollium (1.25g/L) and group 5 used as control group. The chickens were kept under clean area by changing their litter within 12 hours to avoid cross contamination and fed a standard diet and water and treated for 60 days.

2.3. Study Design

This study was conducted to determine the effect of garlic as coccidiostats in prevention and control of Coccidiosis in chicken. Chickens were randomly distributed in the five groups depending on the types of breed, age and the management practiced with in the farm. Ages of the chickens were taken from data recorded of the farm.

2.4. Study Methodology

2.4.1. Experimental design

The experimental groups were arranged and leveled as follows: Group 1(T1) infected and treated with 2gm garlic powder, Group 2 (T2) infected and treated with 4gm garlic powder, Group 3 (T3) infected and treated with 8gm garlic powder, Group 4 (T4) infected and treated with 1.25gm amprollium and Group 5 (T5) infected and non treated used as control. After seven days administration of garlic powder, chickens were administered a single dose of approximately 50,000 sporulated oocysts with 1ml of distilled water orally by syringe.

2.4.2. Coprological Examination

For each of the birds faecal samples were collected from droppings where possible or with a spatula for freshly voided feces. The fecal samples were put into sample bottles. Gross fecal examinations were done before the samples subjected to microscopic examinations (Butterworth, 2001). Bloody diarrhea was investigated from 5th to 17th day after the challenge. The extent of blood in feces was assigned one of the four degrees, from (-) to 3(+++) according to (Youn *et al.,* 1993). Negative was the normal status, whereas 1, 2, and 3 corresponded to 33, 33-66, 66-99% blood in total feces, respectively. Excreted oocysts were counted from 5 to 17 days after infection with *E. tennella* using McMaster counting chamber using standard floatation technique (Annex 1).

2.5. Data Analysis

Data were analyzed using the general linear model procedures of SPSS version 20 software. Differences between treatment means were separated using Duncan's multiple range test ($P<0.05$) (Duncan's, 1955).

3. Result

3.1. Blood in Feces

Bloody diarrhea of almost all experimental groups was observed from the 8th to 17th day after challenge with *E. tenella*. Accordingly, bloody diarrhea was observed from the 8th to 17th day in group1 and 5. Group 2 showed bloody diarrhea that peaked on Day 11 and decreased then after with no blood on the 17th day. Groups treated with 8gm of garlic powder and 1.25gm of amprollium had milder and bloody diarrhea over the shortest time than the other groups throughout the experimental period (Table 1).

3.2. Oocyst Count

Excreted oocysts in the groups treated with T1 and T2 garlic powder (total 69,000 and 49,823/g of feces, respectively) were relatively lower than that of

the infected control group 404,533/g of feces). In all treated groups, the peak excretion of oocysts was seen at eight days then the excretion of oocysts in feces decreased as the time going on. The fecal oocysts count showed that continues decline with an increasing dose of garlic as one moves across from the infected control to those treated with amprollium. During the first weeks, after infection excretion of oocysts were significantly different among the groups. At the end of experiment, excretion of oocysts in the groups treated with T3 and T4 were not significantly different. On the other hand T1 and T2 showed that significant difference on the day 17. Infected and non treated group across experimental period were not significantly different but significantly different in all other treated group.

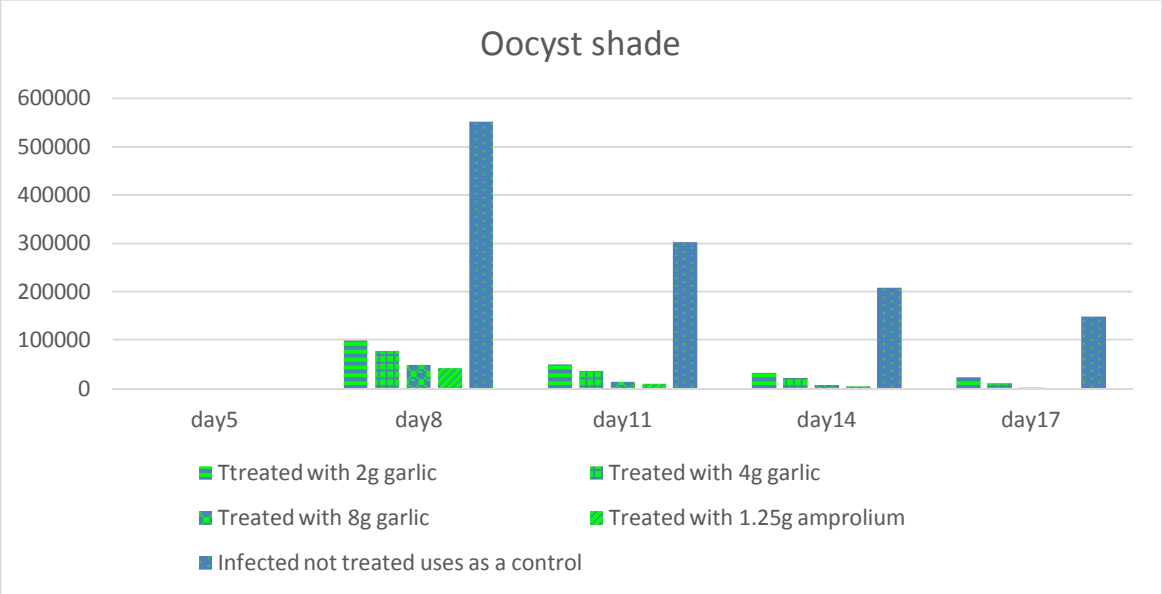
Table 1: Bloody diarrhea of chickens treated with garlic powder and amprollium after challenged with *Eimeria tenella*

Blood in feces after infection	Day5	Day8	Day11	Day14	Day17
T1	-	+	++	+	+
T2	-	+	++	+	-
T3	-	+	+	-	-
T4	-	+	+	-	-
T5	-	++	+++	++	+

Table2: oocysts count Mean ± standard deviation from the control infected and treated group

Group	Day5	Day8	Day11	Day14	Day17
T1	0	16467^{b}	8417^{bb}	5567^{b}	4050^{b}
T2	0	13050^{c}	6200^{b}	3645^{b}	2016^{c}
T3	0	8117^{cd}	2333^{cd}	1383^{cc}	466^{dd}
T4	0	7133^{d}	1850^{d}	900^{c}	50^{d}
T5	0	91933^{a}	5066^{a}	3483^{a}	2483^{a}
SEM	0	1846	1416	780	526
P-value	0	0.001	0.001	0.001	0.001

Means with the same letter superscript are not differ significantly ($p<0.05$)



Figer1: total oocysts shade in the treated group

4. Discussion

This study indicated the effectiveness of *Allium. sativum* in prevention of coccidiosis on white leghorn chickens. After challenge with *E. tenella*, the bloody diarrhea and excreted oocysts of feces were investigated during 5th to 17th days. The efficacy of garlic increased with the amount of garlic increased from T1 to T3 and also feces containing bloody diarrhea decreased. In group treated with T1 contents of bloody diarrhea were higher or 2(++) on the day of 8 when we compared with T2, T3, T4 but lower than T5 infected and not treated because garlic prevents ceacum damage due to the presence of anti inflammatory properties in garlic protecting host tissue from injuries induced by parasite this is also reported in (Gu *et al*., 2003). But on those infected and not treated group the excretion of feces with bloody diarrhea continued until the last experimental days and high bloody content were observed 3(+++) at day 8 and showed then decreasing of bloody containing feces along with time.

Garlic exhibits anticoccidial effect, evidenced significantly lowering in output of *Emeria tennella* oocysts excretes in those infected chickens. Results presented in the Table2 cleared that final excretion of oocysts were not significantly ($p<0.05$) different with T3 and T4 groups while, significant difference was observed between T1 and T2 groups on the last day of experimental period. There were significant ($p<0.05$) differences in between variable garlic treated groups. Meanwhile, the best reduction of oocysts was counted in T3 which was not significantly different from standard drug amprollium ($p<.001$) this diminished output reflects that garlic impairs the development of parasites in the host before the relatively inert oocysts are formed and finally released.

The fact that, garlic poses anticoccidial activity has been also reported in rabbit Coccidiosis (Toula and Al-Rawi, 2007) accordingly garlic contain enzyme allinase which prevents the uptake of thiamine by the oocysts this results in weakness of the agent and hinders to multiply in the intestine. The oocyst count was decreased across a period of experiment in all groups. The peak oocyst count was recorded in day8. Final excretion of oocysts significantly ($p<0.05$) different with T3 treated and T5 while, insignificant difference were observed between T3 and T4 groups ($p<0.001$). There were significant ($p<0.05$) differences in between T1 and T2 treated groups. Meanwhile, the best reduction of oocysts was counted in which T3 and T4. This indicates that 8gm garlic/l of water were prevent Coccidiosis and used as an alternative drug in rural areas for those were not access to the standard drug amprollium. Therefore, the use of garlic 8gm/l of water (T3) is better in controlling coccidiosis of poultry than other T1 and T2. From these results it could be stated that garlic powder is a promising natural drug for prevention and control of coccidiosis in poultry backyard keeping system but further analysis must be done to standardize their effect and proper dosage.

5. Conclusions

The results suggest that adding garlic on feed decrease negative impact of *Eimeria* infection on white leghorn chickens. The beneficial effect of the garlic on reduction in the number of Oocysts per gram of excreta and blood in feces as a result of cecal damage of the infected chickens was comparable to that exhibited by amprollium. Therefore, components within *Alium. sativum* could limit the growth and development of *Eimeria.tenella* in the host body and reduce the oocysts formation and appearance in feces. Based on the above conclusion the following recommendations were forwarded:

- ✓ supplementation of garlic could used in poultry feed as a preventive coccidiostat.
- ✓ Further investigation of the effects of garlic on production performance and such as feed intake, meat and egg production and quality should be done.

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